

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

- 1 1. (Original) A read channel, comprising:
2 an equalizer configured to equalize a digital signal to provide equalized
3 reproduced signals; and
4 a Viterbi detector capable of receiving the equalized reproduced signals and
5 converting the reproduced signals into a digital output signal indicative of data stored on
6 a recording medium;
7 wherein the equalizer is implemented using a coefficient learning circuit that
8 adaptively updates coefficients for the equalizer based upon a cosine function.

- 1 2. (Original) The read channel of claim 1, wherein the coefficient
2 learning circuit adjusts coefficients using a tap coefficient update equation having a first
3 parameter, k , for modifying a magnitude response.

- 1 3. (Currently Amended) The read channel of claim 2, wherein the first
2 parameter, k , is adjusted according to $k=k-g*(f(a_{k+1})+f(a_{k-1}))*e_k$, where k is the cosine
3 equalizer parameter for modifying the magnitude response, g is an update attenuation
4 gain, $f()$ is a predetermined cosine function, a_{k+1} represents a bit to be detected at time
5 $k+1$, a_{k-1} represents a bit to be detected at time $k-1$, and e_k is an error signal based on a
6 difference between a noisy equalized signal and a desired noiseless signal.

1 4. (Original) The read channel of claim 2, wherein the coefficient
2 learning circuit adjusts coefficients using a tap coefficient update equation having a
3 second parameter, j , for modifying a phase response.

1 5. (Currently Amended) The read channel of claim 4, wherein the second
2 parameter, j , is adjusted according to $j=j-g*(f(a_{k+2})+f(a_{k-2}))*e_k$, where j is the cosine
3 equalizer parameter for modifying the phase response, g is an update attenuation gain, $f()$
4 is a predetermined cosine function, a_{k+2} represents a bit to be detected at time $k+2$, a_{k-2}
5 represents a bit to be detected at time $k-2$, and e_k is an error signal based on a difference
6 between a noisy equalized signal and a desired noiseless signal.

1 6. (Original) The read channel of claim 1, wherein the coefficient
2 learning circuit adjusts coefficients using a tap coefficient update equation having a
3 parameter, j , for modifying a phase response.

1 7. (Currently Amended) The read channel of claim 1, wherein the coefficient
2 learning circuit adjusts coefficients, w_i , according to $w_i=w_i-g*f(a_{k-i})*e_k$, where g is a
3 provided update attenuation gain and $f(a_{k-i})$ is a predetermined cosine function and a_{k+i}
4 represents a bit to be detected at time $k+i$ based on the cosine function.

1 8. (Original) The read channel of claim 7, wherein $f(a_{k-i})$ is chosen to be
2 $a_{k-i}-a_{k-i-2}$, wherein written bits that are to be detected, a_{k-i} , are convolved with a PR4
3 response based upon the cosine function.

1 9. (Original) The read channel of claim 7, wherein $f(a_{k-i})$ is chosen to be
2 $a_{k-i} + a_{k-i-1} - a_{k-i-2} - a_{k-i-3}$, wherein written bits that are to be detected, a_{k-i} , are convolved
3 with the EPR4 response based upon the cosine function.

1 10. (Original) The read channel of claim 7, wherein $f(a_{k-i})$ is chosen to be
2 $a_{k-i}t_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with t_k based upon
3 the cosine function.

1 11. (Original) The read channel of claim 7, wherein $f(a_{k-i})$ is chosen to be
2 $a_{k-i}h_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with h_k based upon
3 the cosine function.

1 12. (Original) A waveform equalizer that equalizes a waveform of a
2 reproduction signal obtained by reproducing marks and non-marks recorded on a
3 recording medium, comprising:
4 a delay element that delays a propagation of the reproduced signal;
5 a plurality of multipliers that multiply predetermined coefficients by the
6 reproduction signal and the delayed signal from the delay element;
7 a coefficient learning circuit that adaptively updates the predetermined
8 coefficients for each of the plurality of multipliers; and
9 an adder that adds outputs from the plurality of multipliers;
10 wherein the coefficient learning circuit adaptively updates coefficients for the
11 equalizer based upon a cosine function.

1 13. (Original) The waveform equalizer of claim 12, wherein the
2 coefficient learning circuit adjusts coefficients using a tap coefficient update equation
3 having a first parameter, k , for modifying a magnitude response.

1 14. (Currently Amended) The waveform equalizer of claim 13, wherein the
2 first parameter, k , is adjusted according to $k=k-g*(f(a_{k+1})+f(a_{k-1}))*e_k$, where k is the
3 cosine equalizer parameter for modifying the magnitude response, g is an update
4 attenuation gain, $f()$ is a predetermined cosine function, a_{k+1} represents a bit to be
5 detected at time $k+1$, a_{k-1} represents a bit to be detected at time $k-1$, and e_k is an error
6 signal based on a difference between a noisy equalized signal and a desired noiseless
7 signal.

1 15. (Original) The waveform equalizer of claim 13, wherein the
2 coefficient learning circuit adjusts coefficients using a tap coefficient update equation
3 having a second parameter, j , for modifying a phase response.

1 16. (Currently Amended) The waveform equalizer of claim 15, wherein the
2 second parameter, j , is adjusted according to $j=j-g*(f(a_{k+2})+f(a_{k-2}))*e_k$, where j is the
3 cosine equalizer parameter for modifying the phase response, g is an update attenuation
4 gain, $f()$ is a predetermined cosine function, a_{k+2} represents a bit to be detected at time
5 $k+2$, a_{k-2} represents a bit to be detected at time $k-2$, and e_k is an error signal based on a
6 difference between a noisy equalized signal and a desired noiseless signal.

1 17. (Original) The waveform equalizer of claim 12, wherein the
2 coefficient learning circuit adjusts coefficients using a tap coefficient update equation
3 having a parameter, j , for modifying a phase response.

1 18. (Currently Amended) The waveform equalizer of claim 12, wherein the
2 coefficient learning circuit adjusts coefficients, w_i , according to $w_i = w_i - g * f(a_{k-i}) * e_k$,
3 where g is a provided update attenuation gain and $f(a_{k-i})$ is a predetermined cosine
4 function and a_{k+i} represents a bit to be detected at time $k+i$ based on the cosine function.

1 19. (Original) The waveform equalizer of claim 18, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} - a_{k-i-2}$, wherein written bits that are to be detected, a_{k-i} , are convolved
3 with a PR4 response based upon the cosine function.

1 20. (Original) The waveform equalizer of claim 18, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} + a_{k-i-1} - a_{k-i-2} - a_{k-i-3}$, wherein written bits that are to be detected, a_{k-i} , are
3 convolved with the EPR4 response based upon the cosine function.

1 21. (Original) The waveform equalizer of claim 18, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} t_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with t_k
3 based upon the cosine function.

1 22. (Original) The waveform equalizer of claim 18, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i}h_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with h_k
3 based upon the cosine function.

1 23. (Original) A signal processing system, comprising:
2 memory for storing data therein; and
3 a processor, coupled to the memory, for equalizing a digital signal to provide
4 equalized reproduced signals, the processor adaptively updates coefficients for the
5 equalizer based upon a cosine function.

1 24. (Original) The signal processing system of claim 23, wherein the
2 processor adjusts coefficients using a tap coefficient update equation having a first
3 parameter, k , for modifying a magnitude response.

1 25. (Currently Amended) The signal processing system of claim 24, wherein
2 the first parameter, k , is adjusted according to $k=k-g*(f(a_{k+1})+f(a_{k-1}))*e_k$, where k is the
3 cosine equalizer parameter for modifying the magnitude response, g is an update
4 attenuation gain, $f()$ is a predetermined cosine function, a_{k+1} represents a bit to be
5 detected at time $k+1$, a_{k-1} represents a bit to be detected at time $k-1$, and e_k is an error
6 signal based on a difference between a noisy equalized signal and a desired noiseless
7 signal.

1 26. (Original) The signal processing system of claim 24, wherein the
2 processor adjusts coefficients using a tap coefficient update equation having a second
3 parameter, j , for modifying a phase response.

1 27. (Currently Amended) The signal processing system of claim 26, wherein
2 the second parameter, j , is adjusted according to $j=j-g*(f(a_{k+2})+f(a_{k-2}))*e_k$, where j is the
3 cosine equalizer parameter for modifying the phase response, g is an update attenuation
4 gain, $f()$ is a predetermined cosine function, a_{k+2} represents a bit to be detected at time
5 $k+2$, a_{k-2} represents a bit to be detected at time $k-2$, and e_k is an error signal based on a
6 difference between a noisy equalized signal and a desired noiseless signal.

1 28. (Original) The signal processing system of claim 23, wherein the
2 processor adjusts coefficients using a tap coefficient update equation having a parameter,
3 j , for modifying a phase response.

1 29. (Currently Amended) The signal processing system of claim 23, wherein
2 the coefficient learning circuit adjusts coefficients, w_i , according to $w_i=w_i-g*f(a_{k-i})*e_k$,
3 where g is a provided update attenuation gain and $f(a_{k-i})$ is a predetermined cosine
4 function and a_{k+i} represents a bit to be detected at time $k+i$ based on the cosine function.

1 30. (Original) The signal processing system of claim 29, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i}-a_{k-i-2}$, wherein written bits that are to be detected, a_{k-i} , are convolved
3 with a PR4 response based upon the cosine function.

1 31. (Original) The signal processing system of claim 29, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} + a_{k-i-1} - a_{k-i-2} - a_{k-i-3}$, wherein written bits that are to be detected, a_{k-i} , are
3 convolved with the EPR4 response based upon the cosine function.

1 32. (Original) The signal processing system of claim 29, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i}t_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with t_k
3 based upon the cosine function.

1 33. (Original) The signal processing system of claim 29, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i}h_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with h_k
3 based upon the cosine function.

1 34. (Original) A magnetic storage device, comprising:
2 a magnetic storage medium for recording data thereon;
3 a motor for moving the magnetic storage medium;
4 a head for reading and writing data on the magnetic storage medium;
5 an actuator for positioning the head relative to the magnetic storage medium; and
6 a data channel for processing encoded signals on the magnetic storage medium,
7 the data channel comprising an equalizer configured to equalize a digital signal to
8 provide equalized reproduced signals and a Viterbi detector capable of receiving the
9 equalized reproduced signals and converting the reproduced signals into a digital output
10 signal indicative of data stored on a recording medium; wherein the equalizer is
11 implemented using a coefficient learning circuit that adaptively updates coefficients for
12 the equalizer based upon a cosine function.

1 35. (Original) The magnetic storage device of claim 34, wherein the
2 equalizer adjusts coefficients using a tap coefficient update equation having a first
3 parameter, k , for modifying a magnitude response.

1 36. (Currently Amended) The magnetic storage device of claim 35, wherein
2 the first parameter, k , is adjusted according to $k=k-g*(f(a_{k+1})+f(a_{k-1}))*e_k$, where k is the
3 cosine equalizer parameter for modifying the magnitude response, g is an update
4 attenuation gain, $f()$ is a predetermined cosine function, a_{k+1} represents a bit to be
5 detected at time $k+1$, a_{k-1} represents a bit to be detected at time $k-1$, and e_k is an error
6 signal based on a difference between a noisy equalized signal and a desired noiseless
7 signal.

1 37. (Original) The magnetic storage device of claim 35, wherein the
2 equalizer adjusts coefficients using a tap coefficient update equation having a second
3 parameter, j , for modifying a phase response.

1 38. (Currently Amended) The magnetic storage device of claim 37, wherein
2 the second parameter, j , is adjusted according to $j=j-g*(f(a_{k+2})+f(a_{k-2}))*e_k$, where j is the
3 cosine equalizer parameter for modifying the phase response, g is an update attenuation
4 gain, $f()$ is a predetermined cosine function, a_{k+2} represents a bit to be detected at time
5 $k+2$, a_{k-2} represents a bit to be detected at time $k-2$, and e_k is an error signal based on a
6 difference between a noisy equalized signal and a desired noiseless signal.

1 39. (Original) The magnetic storage device of claim 34, wherein the
2 equalizer adjusts coefficients using a tap coefficient update equation having a parameter,
3 j , for modifying a phase response.

1 40. (Currently Amended) The magnetic storage device of claim 34, wherein
2 the coefficient learning circuit adjusts coefficients, w_i , according to $w_i = w_i - g * f(a_{k-i}) * e_k$,
3 where g is a provided update attenuation gain and $f(a_{k-i})$ is a predetermined cosine
4 function and a_{k+i} represents a bit to be detected at time $k+i$ based on the cosine function.

1 41. (Original) The magnetic storage device of claim 40, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} - a_{k-i-2}$, wherein written bits that are to be detected, a_{k-i} , are convolved
3 with a PR4 response based upon the cosine function.

1 42. (Original) The magnetic storage device of claim 40, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} + a_{k-i-1} - a_{k-i-2} - a_{k-i-3}$, wherein written bits that are to be detected, a_{k-i} , are
3 convolved with the EPR4 response based upon the cosine function.

1 43. (Original) The magnetic storage device of claim 40, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} t_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with t_k
3 based upon the cosine function.

1 44. (Original) The magnetic storage device of claim 40, wherein $f(a_{k-i})$ is
2 chosen to be $a_{k-i} h_k$, wherein written bits that are to be detected, a_{k-i} , are convolved with h_k
3 based upon the cosine function.

1 45. (Original) A read channel, comprising:
2 means for equalizing a digital signal to provide equalized reproduced signals; and
3 means, coupled to the means for equalizing, for receiving the equalized
4 reproduced signals and converting the reproduced signals into a digital output signal
5 indicative of data stored on a recording medium;
6 wherein the means for equalizing is implemented using means for adaptively
7 updating coefficients for the means for equalizing based upon a cosine function.

1 46. (Original) A waveform equalizer that equalizes a waveform of a
2 reproduction signal obtained by reproducing marks and non-marks recorded on a
3 recording medium, comprising:
4 means for delaying propagation of a reproduced signal;
5 means for multiplying predetermined coefficients by the reproduced signal and
6 the delayed signal from the means for delaying;
7 means for adaptively updating the predetermined coefficients for the means for
8 multiplying; and
9 means for adding outputs from the means for multiplying;
10 wherein the means for adaptively updating the predetermined coefficients updates
11 the predetermined coefficients based upon a cosine function.